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BIOLOGY OF THE MEXICAN COTTON BOLL WEEVIL VII: THE BOLL WEEVIL IN ARTIFICIAL HIBERNATION QUARTERS[1]

By EDGAR F. GROSSMAN

Repeated experimentation with the conventional type of hibernation cages in which cotton boll weevils (*Anthonomus grandis* Boh.) were placed resulted in the construction of a new type hibernation cage in which various factors which influence the hibernation phenomena could be considered individually. The new type cage consisted of a 16-mesh screen cylinder measuring nine feet in length and about one foot in diameter. Nine smaller tubes measuring 12 inches in length and three inches in diameter were inserted horizontally along the cylinder wall at one foot intervals. The nine foot cylinder was not equipped with hibernating materials but each one of the smaller tubes was filled with Spanish moss, as illustrated in Fig. 1. The open ends of the tubes were fitted with corks.

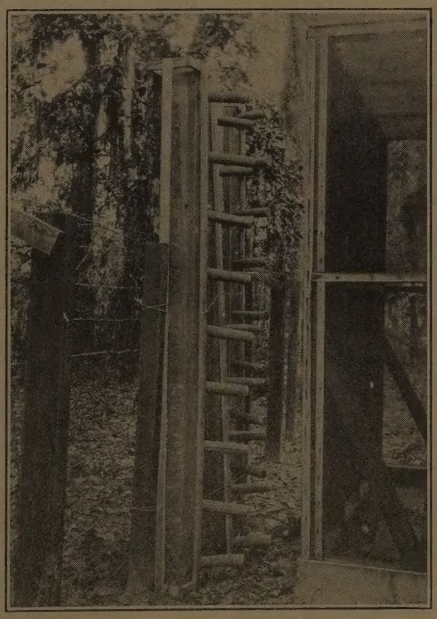

Fig. 1.—Three cylindrical hibernation cages with the inserted tubes filled with Spanish moss.

[1]Contribution from the Department of Cotton Investigations, Florida Agricultural Experiment Station.

By the use of this type cage the geotropic influences exerted on the boll weevil when it seeks hibernation quarters can be studied. Likewise the influence of moisture can be determined by wetting the Spanish moss in alternate tubes or in sections of adjacent tubes. Furthermore the number of weevils which enter hibernation in the smaller tubes can be noted, thereby providing means for the interpretation of weevil survival based on the number of weevils which actually entered hibernation rather than on the total number of weevils placed in the cage.

Frequent observations made while boll weevils emerged from their hibernation quarters in an 8x8x8 foot cage indicated that the majority of the weevils emerged from the uppermost layer of Spanish moss which was supported about six feet above the ground, on a tree trunk.[2] Very few weevils emerged from the moss which was packed about the bottom of the cage. These observations indicated that the boll weevil was negatively geotropic when seeking quarters in which to hibernate.

By liberating weevils at the bottom, in the mid-section and at the top of individual cylindrical cages, respectively, the geotropic influences exerted on the weevil could be detected. The weevils, in their search for hibernation quarters, entered the moss-filled tubes which ranged from one to nine feet above the ground. Subsequent counts of the numbers of weevils entering each tube were made. Data were secured from a total of 24 cages which were used for experimentation for three consecutive years: in eight of the cages the weevils were liberated at the bottom; in eight at the middle; and in eight at the top. The data secured from the combined series of eight cages show a marked similarity in view of the fact that the largest percent of the weevils entered hibernation in the uppermost tube, though the series in which the weevils were liberated at the top showed a great increase in the number of weevils which entered hibernation in the top tube. Whether the weevils were liberated at the bottom or in the middle of the cage apparently made little difference in the weevil dispersion. These data are presented in Table I.

The fact that the weevils were confined in the cages during daylight and therefore might have been influenced by phototropic influences which in turn might have caused them to crawl toward the top of the cage, was also considered. A test including

[2]Grossman, Edgar F. Diurnal Observations of the Emergence of Boll Weevils from Their Hibernation Quarters. The Florida Ent. Vol. XIV. No. 3, pp. 45-52, Sept. 1930.

a series of three cages in which the weevils were liberated at the bottom, middle and top of each cage, respectively, was conducted in a cooled dark-room. In the absence of light the weevils reacted as they did in the presence of light. The assumption therefore that geotropic influences caused the majority of the weevils to hibernate in the uppermost tubes seems tenable.

TABLE I.—THE NUMBER AND PERCENT OF WEEVILS FOUND IN THE NINE, TUBES FILLED WITH SPANISH MOSS DURING EXPERIMENTATION WITH 24 CAGES.

Number of moss-filled cage tubes (from top to bottom)	Section of cage in which weevils were placed					
	Bottom		Middle		Top	
	Number weevils found	Percent of total number found	Number weevils found	Percent of total number found	Number weevils found	Percent of total number found
1	692	33.02	786	32.52	1,133	58.34
2	301	14.36	573	23.71	243	12.51
3	251	11.98	225	9.31	179	9.22
4	145	6.92	219	9.06	84	4.33
5	124	5.92	156	6.45	58	2.99
6	123	5.87	152	6.29	45	2.32
7	147	7.01	96	3.97	60	3.09
8	170	8.11	79	3.27	53	2.73
9	143	6.82	131	5.42	87	4.48
Totals	2,096	100.01	2,417	100.00	1,942	100.01

Other experiments devised to determine the influences of moisture were also conducted in a cooled dark-room. In one cage the Spanish moss in the bottom four tubes was moistened and the weevils were liberated at the bottom of the cage. In the second cage the moss in the alternate tubes was moistened and the weevils were liberated in the middle of the cage. In the third cage the moss in the four uppermost tubes was moistened and the weevils were liberated at the top of the cage. Where the bottom tubes were moistened the greatest number of weevils entered hibernation in the lower tubes. In the cage where the upper tubes were moistened the greatest number of weevils entering hibernation were found in the uppermost tubes. Where the alternate tubes were moistened a slight deviation from the average distribution which had been previously determined when the moss was not moistened was noticeable. The data are presented in Table II. The indications are that moisture is a factor which can be assumed to attract boll weevils to the quarters in which they hibernate.

TABLE II.—DISTRIBUTION OF BOLL WEEVILS IN THREE CYLINDRICAL HIBERNATION CAGES EQUIPPED WITH NINE TUBES FILLED WITH SPANISH MOSS.

Number of moss-filled cage tubes (from top to bottom)	Section of cage in which weevils were placed					
	Bottom		Middle		Top	
	Number weevils found	Percent of total number found	Number weevils found	Percent of total number found	Number weevils found	Percent of total number found
1	22	10.05	*69	*20.97	*137	*56.15
2	10	4.57	56	17.02	*38	*15.57
3	15	6.85	*42	*12.77	*16	*6.56
4	15	6.85	32	9.73	*8	*3.28
5	22	10.05	*45	*13.68	5	2.05
6	*21	*9.59	29	8.81	4	1.64
7	*31	*14.16	*14	*4.25	9	3.69
8	*38	*17.35	22	6.69	12	4.92
9	*45	*20.55	*20	*6.08	15	6.15
Totals	219	100.02	329	100.00	244	100.01

*Denotes tubes containing wetted Spanish moss. Other tubes dry.

It is not surprising therefore that in Florida cotton growers have been forced to move their cotton planting away from areas neighboring ponds and in which there were Spanish moss-laden trees, since the weevils hibernated there so successfully and reappeared in the fields in such large numbers that the use of control methods involved too much expense for producing cotton economically.

Hibernation cage data is usually interpreted on the assumption that when groups of weevils are caught in the cotton fields each group contains practically the same percent of weevils which are prepared for hibernation and that they will subsequently enter hibernation in equal numbers on being confined in the hibernation cage. The resultant emergence data, however, are very irregular when the survival percentages of the successfully over-wintered weevils are considered. The discrepancies are, in all probability, due to the fact that the survival percents are based on the number of weevils placed in the cage —regardless of their condition—rather than on the number of weevils which actually entered hibernation.

In the fall of 1927, over 20,000 weevils were placed in a large hibernation cage during a period extending over three weeks. About a week after the last weevils had been placed in the cage a total of 2,100 weevils were found dead. Subsequent examination of other hibernation cages showed a similar high rate of mortality of weevils which occurred during the initial period of confinement in the cages. Obviously the interpretation of the data which were accumulated to record the percent of winter

survival in the light of offering information relative to the spring infestation which might be expected, met with the embarrassing question whether or not the number of weevils which died before they entered hibernation should be deducted from the total number placed in the cage. Since a thorough search for the dead weevils could not be made, a condition due to the inadvisability of disturbing the debris in which other weevils had hibernated, the survival data generally have been based on the number of weevils which had been placed in the cages. The construction of the new type cylindrical hibernation cage, however, provided means for determining the number of weevils which failed to enter hibernation without disturbing the weevils which had entered.

TABLE III.—THE NUMBER AND PERCENT OF WEEVILS WHICH ENTERED HIBERNATION AND THE NUMBER AND PERCENT OF WEEVILS WHICH DID NOT ENTER HIBERNATION IN 24 CYLINDRICAL CAGES.

Cage number	Number weevils placed in cage	Number weevils found hibernating	Percent weevils found hibernating	Number weevils not in hibernation	Number weevils lost	Percent weevils lost and not in hibernation
1	300	162	54.0	120	8	46.0
2	300	16	5.3	37	247	94.7
3	300	88	29.3	34	178	70.7
4	1,000	359	35.9	634	7	64.1
5	1,000	236	23.6	749	15	76.4
6	1,000	107	10.7	397	496	89.3
7	1,000	223	22.3	328	449	77.7
8	1,000	163	16.3	509	328	83.7
9	1,000	140	14.0	604	256	86.0
10	1,000	121	12.1	642	237	87.9
11	1,000	324	32.4	611	65	67.6
12	1,000	103	10.3	211	686	89.7
13	1,000	490	49.0	510	0	51.0
14	1,000	346	34.6	586	68	65.4
15	1,000	478	47.8	522	0	52.2
16	1,000	463	46.3	494	43	53.7
17	1,000	528	52.8	345	127	47.2
18	1,000	265	26.5	407	328	73.5
19	1,000	269	26.9	*	.....	.....
20	1,000	438	43.8	.....	.....	.....
21	1,000	334	33.4	.....	.....	.....
22	1,000	329	32.9	.....	.....	.....
23	500	244	24.4	.....	.....	.....
24	500	219	21.9	.....	.....	.....

*Not recorded

Of the 20,900 weevils which were placed in 24 cylindrical hibernation cages, a total of 6,445 or 30.84 percent entered hiber-

nation. The other weevils either died before entering hibernation and were subsequently carried off by ants, or escaped. A list of the number of weevils placed in each of the 24 cages, the number and percent found hibernating and the number and percent of the weevils which did not enter hibernation are presented in Table III. The weevils were all captured on November 6, 7 and 8, which is generally the most favorable time for placing weevils in hibernation cages in Florida. Nevertheless, the percent of the weevils which entered hibernation varied in individual cages from 5.3 percent to 52.8 percent. Consequently, the survival percentage, when computed from the total number of weevils placed in the cages would vary considerably also.

In order to illustrate this point more clearly nine of the cylindrical cages were examined at intervals extending from 44 to 162 days after the weevils had been placed in the cages. The percents survival, when based on the number of weevils which were placed in the cage (1,000 specimens in each cage) varied from 5.4 percent to 29.7 percent. When, however, the survival percent was based on the number of weevils which entered hibernation the variation was greatly reduced, extending from 50.5 percent to 85.9 percent. These data are presented in Table IV.

TABLE IV.—INTERPRETATION OF BOLL WEEVIL SURVIVAL BASED ON THE NUMBER OF WEEVILS PLACED IN HIBERNATION CAGES AND ON THE NUMBER OF WEEVILS WHICH ENTERED HIBERNATION.

Cage number	Date examined 1929	Number days in hibernation	Percent weevils living	
			On basis of 1,000 weevils placed in cage	On basis of number weevils which entered hibernation
1	Dec. 20	44	17.0	67.4
2	Jan. 4	59	8.2	76.6
3	Jan. 25	80	29.7	80.2
4	Feb. 8	93	19.0	84.8
5	Feb. 22	107	14.2	85.9
6	Mar. 8	121	8.3	58.6
7	Mar. 22	134	7.2	57.9
8	Apr. 5	148	22.9	68.5
9	Apr. 19	162	5.4	50.5

Of especial significance are the three cages which were examined on March 22, April 5 and 19, respectively. The counts based on the total number of weevils placed in the cages shows that 7.2 percent, 22.9 percent and 5.4 percent respectively, survived. The counts, however, in which only those weevils which entered hibernation were included in the calculations shows that 57.9 percent, 68.5 percent and 50.5 percent of the weevils survived.

With this interpretation of hibernation cage data in mind the great variations which occur from year to year, or even during the same year in different cages, can be better understood.

With the exception of the first two groups (Table IV) the weevils which were removed from their hibernation quarters in the cylindrical cages were placed in a low temperature incubator kept at 47°F. and from 79 percent to 85 percent relative humidity.[3] The rate of survival of the weevils is presented in Table V. A large percentage of the weevils lived until May 31, the time when they first appear in the cotton fields in large numbers. A month later many weevils were still alive, but by August relatively few of the weevils lived. Hibernation of the weevils in cages exposed to varying temperatures and relative humidity appears to be attendant with the same success as the hibernation of the weevils kept at a constant optimum temperature and relative humidity.

TABLE V.—PERCENT WEEVILS LIVING IN A LOW TEMPERATURE INCUBATOR FOR A SPECIFIED NUMBER OF DAYS AFTER THEIR REMOVAL FROM SEVEN HIBERNATION CAGES, RESPECTIVELY.

	Percent weevils living in incubator after removal from hibernation cages						
Date	Cage No. 1	Cage No. 2	Cage No. 3	Cage No. 4	Cage No. 5	Cage No. 6	Cage No. 7
Jan. 25	100.00	.....	.....	.....	.....	.....	.....
Feb. 8	98.45	100.00	.....	.....	.....	.....	.....
Feb. 22	93.80	94.60	100.00	.....	.....	.....	.....
Mar. 8	87.21	92.43	95.77	100.00	.....	.....	.....
Mar. 22	78.30	84.35	94.36	92.79	100.00	.....	.....
Apr. 5	66.70	80.00	84.18	86.76	91.67	100.00	.....
Apr. 19	62.02	74.60	83.80	84.35	86.12	94.76	100.00
May 3	54.26	63.25	77.46	75.92	79.17	90.83	92.60
May 22	49.23	55.15	67.60	71.10	66.67	82.54	79.64
May 31	44.96	49.19	64.80	67.48	65.28	79.04	75.93
June 14	30.23	38.38	53.52	44.59	55.56	58.95	59.26
June 28	10.08	22.70	28.17	32.54	45.84	40.61	29.63
July 16	2.71	9.37	18.31	16.87	22.22	15.28	1.85
July 26	1.16	5.95	10.56	13.26	13.89	7.86	1.85
Aug. 9	0.00	1.08	1.41	3.62	4.17	3.49	0.00
Aug. 23	.....	0.00	0.00	0.00	1.39	1.31	.....
Aug. 29	.....	.....	.....	.....	1.39	0.87	.....
Sept. 5	.....	.....	.....	.....	0.00	0.44	.....
Sept. 14	.....	.....	.....	.....	.....	0.00	.....

The reliability of the data which are generally obtained from hibernation cages, however, is so questionable that the general use of cages as indicators of probable weevil distribution and population is unwarranted.

[3]Grossman, Edgar F. Biology of the Mexican Cotton Boll Weevil VI. Some Humidity and Temperature Effects on Development and Longevity. The Florida Ent. Vol. XIV. No. 4, pp. 66-71. Dec. 1930.

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A CONTRIBUTION TO THE LIFE HISTORY AND HABITS OF THE CELERY LEAF TYER *Phlyctaenia rubigalis* GUENEE IN FLORIDA

RALPH L. MILLER

ABSTRACT

The celery leaf tyer is commonly present in the celery growing areas of Florida and whenever it has a continuous supply of food material for several months, when the population is not reduced artificially and the meteorological conditions are favorable, it becomes quite destructive. At Sanford, Florida, it feeds on some seventy host plants, many of which are abundant throughout the entire year.

The entire year can very easily be spent in the active stage without any difficulty of feeding, dwarfing or sterility of adults.

The most favorable humidity for development and most rapid reproduction was about 80%.

The celery leaf tyer or greenhouse leaf tyer, *Phlyctaenia rubigalis* Guenee, has done severe damage to celery in Florida for many years. However, many points in its life history and development, especially during the summer months, have been quite obscure. The work of the writer on this subject, covering the period from November 1, 1928 to May 1, 1929, full time, and part time during the remainder of the year 1929, is reported in the following paper. The work was done in the laboratory and field at Sanford, Florida, in a station maintained jointly by the United States Department of Agriculture, Bureau of Entomology, and the State Plant Board of Florida. Occasional trips were made to

the other celery growing areas in the state and studies of celery tyer populations there were made. Many thanks are due the fellow workers of the writer at Sanford, Florida, for their many suggestions regarding the work.

DISTRIBUTION AND HOST PLANTS

The celery leaf tyer is generally distributed over the entire celery growing area of the state of Florida. Its abundance varies from such scarcity during the late summer that it cannot be found, to more than two or three hundred adults per three hundred foot row of celery during the late spring. When the celery is cut during April or May, the adults leave and at that time the larvae can be found on some sixty or seventy host plants, as shown in Table II following. During the growing season for celery, the moth population increases continuously and abundantly, increasing more than 200 times during five months, as shown in Table I.

TABLE I.—ABUNDANCE AND INCREASE OF CELERY LEAF TYER ADULTS DURING THE CELERY GROWING SEASON AT SANFORD, FLORIDA.

Month	Number of Rows	Feet Per Row	Number Moths Per Row
December (1928)	15	300	1
January (1929)	29	300	3
February	21	300	112.5
March	12	300	126.5
April	15	300	201.1

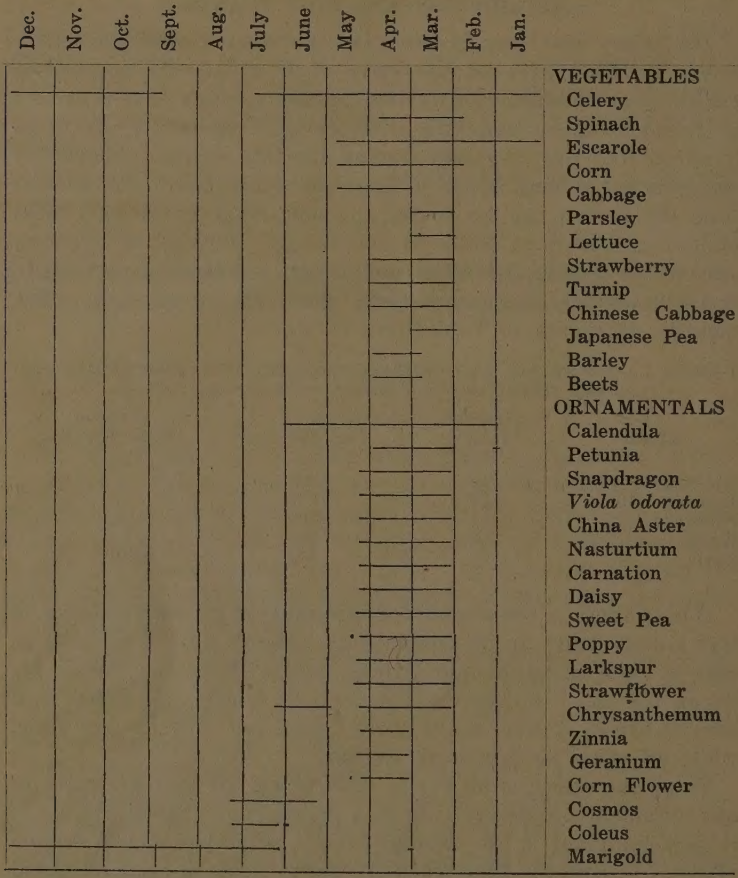
Where there is not a continuous supply of growing celery the tyer cannot build up its population as shown above. In sweepings at both Sarasota and Oviedo, where there is a break between the fall crop and spring crop of celery, not more than twenty-five or thirty moths were found per row at any time, while all other factors were similar.

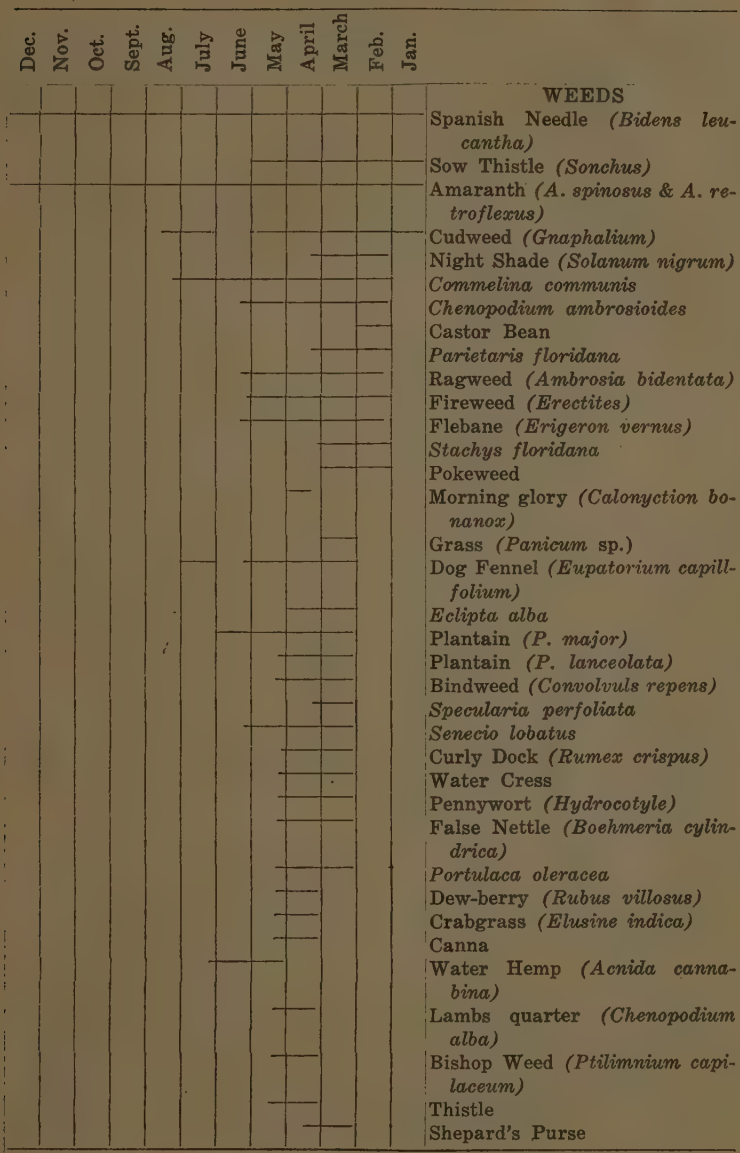
When the celery is all cut in late spring the tyer migrates to any succulent plants growing in a damp, cool, shaded place. It it very abundant in the swamps, woods, ditch banks and similar places. During the time when the celery fields are not irrigated and before the summer rains begin, the celery tyer population along the beaten paths becomes greatly reduced so that by June 15th almost none can be found. However, diligent search will usually reveal a few that are left in the out of the way damp, cool places down in the weeds or swamps.

Many writers have prepared long lists of plants on which this insect will feed. The writer has a similar list composed

of plants on which celery tyer larvae were found feeding at Sanford, Florida, during the year 1929, as shown in Table II.

TABLE II.—SEASONAL HOST PLANTS OF THE CELERY LEAF TYER AT SANFORD, FLORIDA DURING THE YEAR 1929.




Dec.
Nov.
Oct.
Sept.
Aug.
July
June
May
April
March
Feb.
Jan.
WEEDS
Spanish Needle (Bidens leucantha)
Sow Thistle (Sonchus)
Amaranth (A. spinosus & A. retroflexus)
Cudweed (Gnaphalium)
Night Shade (Solanum nigrum)
Commelina communis
Chenopodium ambrosioides
Castor Bean
Parietaris floridana
Ragweed (Ambrosia bidentata)
Fireweed (Erectites)
Flebane (Erigeron vernus)
Stachys floridana
Pokeweed
Morning glory (Calonyction bonanox)
Grass (Panicum sp.)
Dog Fennel (Eupatorium capillfolium)
Eclipta alba
Plantain (P. major)
Plantain (P. lanceolata)
Bindweed (Convolvuls repens)
Specularia perfoliata
Senecio lobatus
Curly Dock (Rumex crispus)
Water Cress
Pennywort (Hydrocotyle)
False Nettle (Boehmeria cylindrica)
Portulaca oleracea
Dew-berry (Rubus villosus)
Crabgrass (Elusine indica)
Canna
Water Hemp (Acnida cannabina)
Lambs quarter (Chenopodium alba)
Bishop Weed (Ptilimnium capilaceum)
Thistle
Shepard's Purse

LIFE HISTORY

After having established the fact that some seventy plants, many of which grew abundantly during the summer months, may serve as host to the celery tyer, it remained to show that the celery tyer would actually live over the summer on these plants. This was done very successfully and is shown in Table III following. Adults or eggs were placed on the plants and a thin muslin bag was placed over that part of the plant. In this cloth cage, the insects developed very abundantly. In a few instances the bags were removed, sometimes accidentally, sometimes intentionally, and in every case the celery tyer larvae finished their development.

An interesting observation was that usually not more than one generation could develop on one plant, for as soon as it became injured by the larvae it became hard, tough and unfit for feeding. For this reason, usually not more than one generation was spent in one place, except on cultivated crops where development was continuous. Since there are but few cultivated crops that harbor celery tyer successfully during the summer months and those on weeds only spend one generation in a place, the difficulty of finding them through the summer is very great.

At Sanford, Florida, the celery tyer passed through nine first born generations and seven last born generations during the year December 1928 to December 1929. These were fed entirely on celery and *Bidens leucantha*.

In all the life history work no difficulty was experienced where the insects were given the proper food and care. All adults were of normal size and the females deposited the normal number of fertile eggs.

For details of the life history work see the following table.

TABLE III.—SUMMARY OF CELERY TYER LIFE HISTORY AND REARING DURING THE YEAR DECEMBER, 1928 TO DECEMBER, 1929.

Months	Av. Temp. °F.	Host Plants	No. Reared	Days Av. Life Cycle	Place of Rearing
December & January	63.25	Celery	37	57.21	Insectary
		Spanish needle *Bidens leucantha*	20	66.5	Insectary
January & February	65.85	Celery	16	49.4	Insectary
		Amaranthus spinosus	17	49.0	Insectary
		Bidens leucantha	12	50.4	Field
		Sonchus sp.	1	55.0	Field

Months	Av. Temp. °F.	Host Plants	No. Reared	Days Av. Life Cycle	Place of Rearing
February & March	68.8	Celery	12	51.6	Insectary
		Fire weed *Erechtites hieracifolia*	8	47.0	Insectary
		Ragweed *Ambrosia bidentata*	12	44.0	Insectary
		Fleabane *Erigeron vernus*	2	43.0	Insectary
		Calendula *Calendula officinalis*	15	45.0	Field
March & April	73.0	Celery	5	36.8	Insectary
		Briad plantain *Plantago major*	6	29.8	Insectary
		Bishop weed *Ptilimnium capillaceum*	7	37.0	Insectary
		Corn *Zea mays*	2	36.6	Insectary
		Dog fennel *Eupatorium capillifolium*	8	40.3	Insectary
May & June	78.6	Celery	10	27.7	Insectary
		Commelina communis	3	28.2	Insectary
		Water hemp *Acnida cannabina*	10	26.3	Insectary
		Square weed *Senecio lobatus*	3	27.6	Insectary
June & July	80.8	Celery	22	26.5	Field-bag
		Chrysanthenum sp.	2	32.0	Yard-open
		Cosmos	24	33.0	Yard-bag
		Bidens leucantha	5	33.5	Yard-bag
		Mexican tea *Chenopodium ambrosiodes*	2	33.0	Yard-bag
		Plantago major	1	25.0	Field-open
		Amaranthus spinosus	3	29.0	Field-bag
July & August	81.8	Celery	18	32.3	Field-bag
		Cosmos	150	33.0	Yard-bag
		Marigold	25	33.0	Yard-bag
		Amaranth	12	32.0	Field-bag
		Mexican tea	10	32.0	Field-bag
		Commelina communis	2	31.5	Field-bag
		Spanish needle	43	33.5	Field-bag
		Violet (*Viola* sp.)	3	31.4	Yard-bag
		Cudweed *Gnaphalium* sp.	2	31.0	Yard-bag
August & September	81.5	Marigold	93	31.2	Yard-bag
		Dog fennel	8	28.0	Swamp-bag
		Spanish needle	83	28.0	Yard-bag
September & October	76.8	Marigold	157	30.0	Yard-bag
		Spanish needle	21	30.5	Yard-bag
October & November	71.6	Marigold	64	35.5	Yard-bag
		Amaranth	11	38.0	Yard-bag
		Celery	26	37.4	Porch-jar
November & December	72.5	Marigold	37	38.7	Yard-bag
		Celery	21	39.0	Porch-jar

Another very important and interesting phase of the life history work was the effect of humidity on development, sex and deposition of eggs. The humidities were controlled by aspirating air through saturated salt solutions. The apparatus was set up in a constant temperature room. Mr. C. O. Bare corroborated the writer's sex determination of the adults. The results are shown in the following Table IV.

TABLE IV.—RELATION BETWEEN HUMIDITY AND DEVELOPMENT OF CELERY LEAF-TYER.

% Humidity	No. reared	Av. Life Cycle—Days	% Male	% Female	Av. No. eggs per female
100%		All died before emerging			
80%	17	32.8	70.6	29.4	144.2
45%	9	33.1	44.5	55.5	35.0
25%	18	34.9	27.8	72.2	0.0
0		All died before pupation			

The writer is quite aware that the small number of insects used in the above experiment would tend to minimize the importance of the findings, but since the results were so striking it was thought advisable to at least make a progress report.

ATHENA PELEUS (Timetes petreus)

ELLEN ROBERTSON MILLER

In Florida a delightful phase of insect collecting is the fact that one may come upon an unlooked for and occasionally a rare specimen which by rights belongs in a more tropical country.

Such was my experience when on June 3, 1926 I found *Athena peleus* (*Timetes petrens* Cramer) in its larval stage, feeding on a fig leaf in my neighbor's yard. It was a caterpillar very different from any I had previously seen. Its length was one and one-half inches and its body had the thickness of an old time slate pencil. Its more striking characteristic was a dorsal pattern of three light diamonds having an opalescent quality. They began on the fifth segment and continued over the eleventh. Dull orange-red tubercles each with a stiff black spine were at the anterior and posterior points of the design, and also where the diamonds joined, four in all. The skin at the base of the tubercles had a bluish metallic sheen. This color in a paler shade, was repeated between the diamonds and the darker triangular side areas. These began at the front of the sixth segment. Each

area showed a black line above and below a gray oval that was outlined in iridescent blue. The second and third and fourth segments each bore a dark oval, and there was a pair of black dots on the dorsum of the first, second and third segments.

The bifurcated head was rough and of a dull red tone, a color that extended back over the first four segments and appeared in the prolegs. The long black spinuled antennae seemed to continue as raised lines on the face. The frons was sculptured with parallel grooves and the adfrontales were conspicuous. It was a colorful caterpillar.

I confined the larva with a spray of its food plant in a breeding jar and on June 6 found it contracted to three fourths of an inch, resting on the lid of the jar. The red color was gone from its skin and the entire body appeared iridescent.

June 7 at 8:30 A.M. the larva was hanging by its anal claspers to the silken mat on the lid which it had spun for the purpose. At 9:30 a pale yellow-green pupa emerged.

The chrysalis had a pair of spines at the cephalic end and a branched spine on either side of the thorax with other spines following. Along the dorsum were three rows of black tubercles, the middle row showing correct spines. The chrysalis had a length of three-fourths of an inch.

I was away from home until June 20. Upon returning I found that the butterfly had emerged and died. The specimen was somewhat frayed but Doctor Kahl of the Carnegie Museum, Pittsburg, identified it for me and kindly hunted out what little had been written about the insect. He showed me the figures of the larva and chrysalis made by Cramer which had been drawn and colored by hand in 17....., and also cases of pinned butterflies, one of which had been taken at Miami, Florida.

By one not conversant with the Lepidoptera the butterfly might be mistaken easily for a swallowtail of the subfamily Papilioninae. This because there are tails on each hind wing, not alone the usual elongation of the Papilioes, but there is an additional, shorter one.

Holland pictures the butterfly as on plate XXI of his Butterfly Book, showing the golden-brown upper surface of the wings crossed by dark brown hands. It is very like my specimen. The under surface of both body and wings is light, the latter showing opalescent tones of blue, lavender, green and brown, a very lovely play of color. A dark line edged with blue goes from the body through the wing to the inner tail extension. Possibly a

butterfly clinging with closed wings to a twig simulates a leaf and this mark suggests its midvein.

My specimen when spread measured two and one-half inches from tip to tip of the fore wings. I have never seen the butterfly in the open, and have found but the one larva. The insect belongs to the subfamily Nymphalinae.

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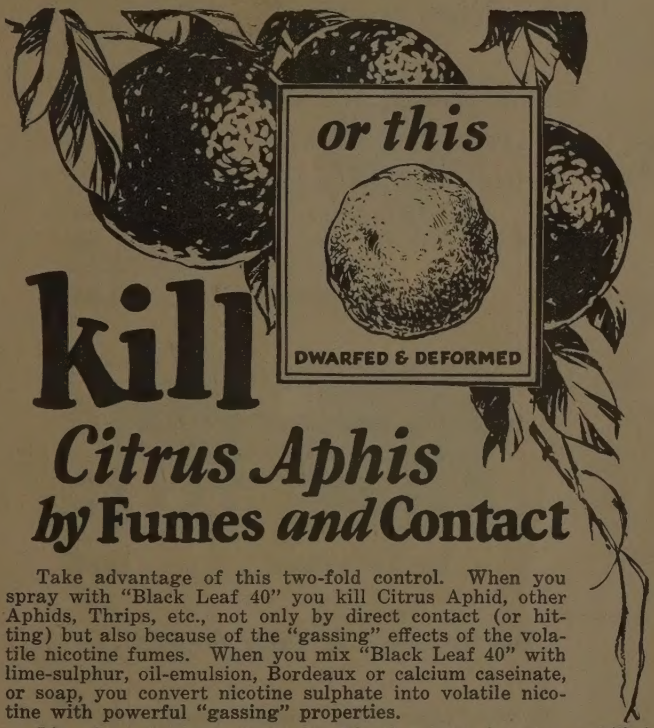

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